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(56) Documents Cited

US 5334038 A

US 5211571 A

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US 4828510 A

US 3970353 A

(58) Field of Search

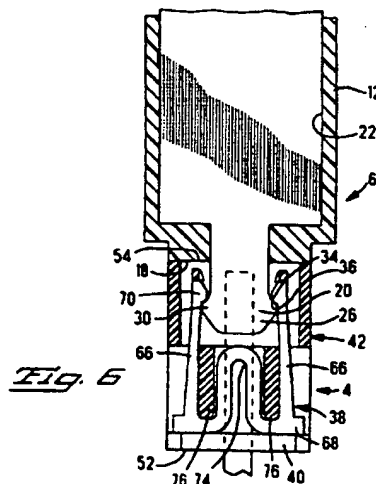
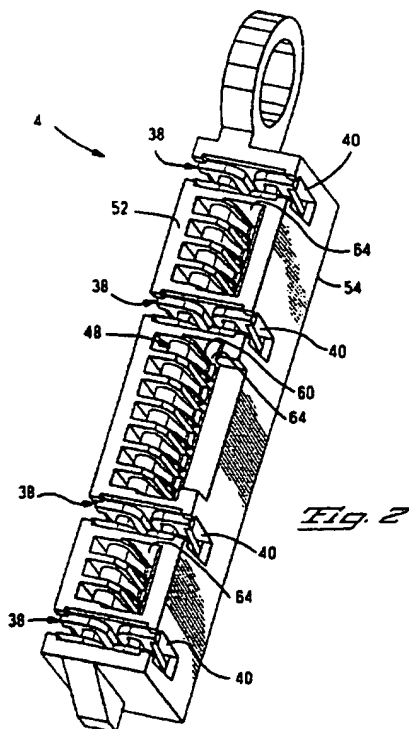
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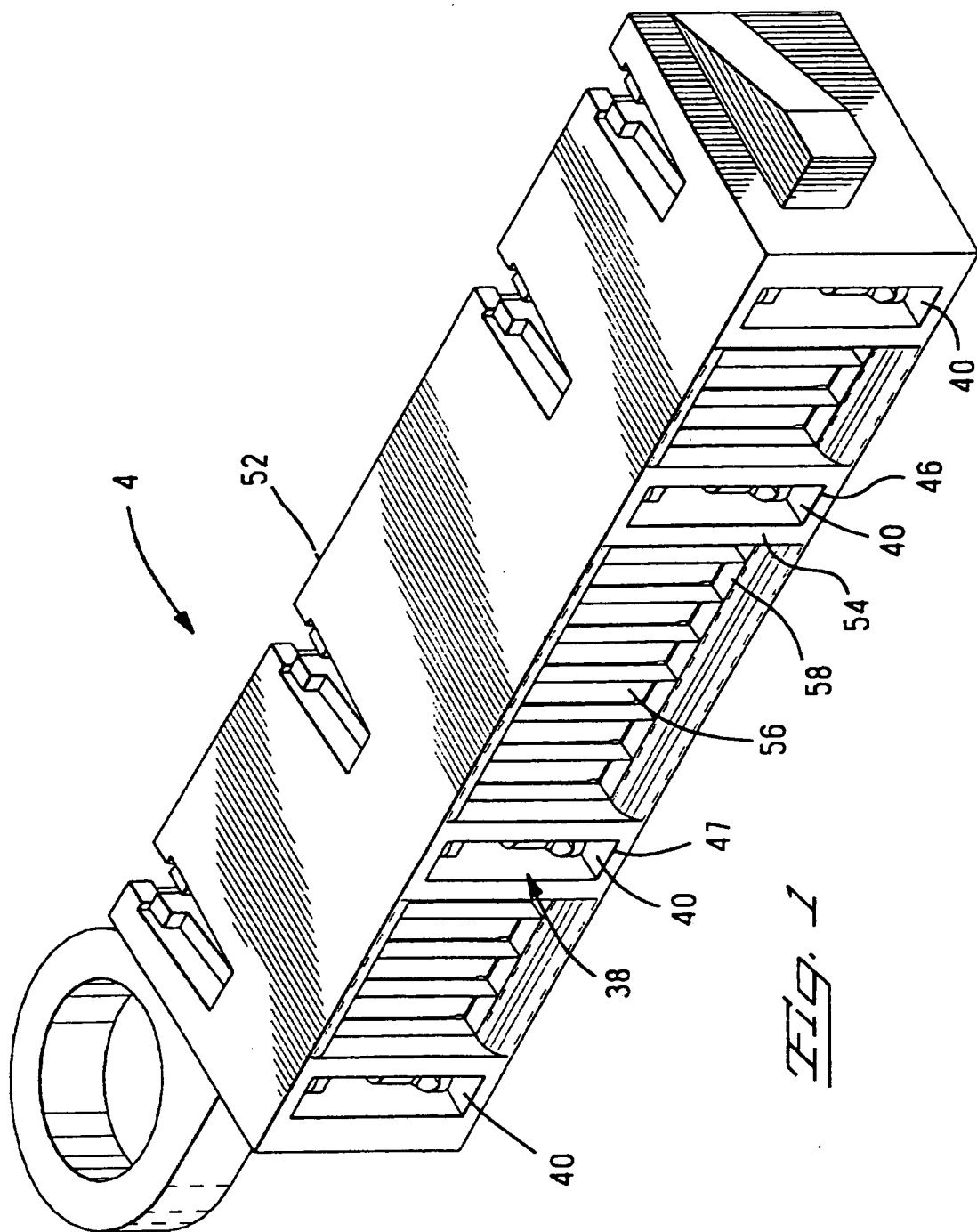
(54) Abstract Title

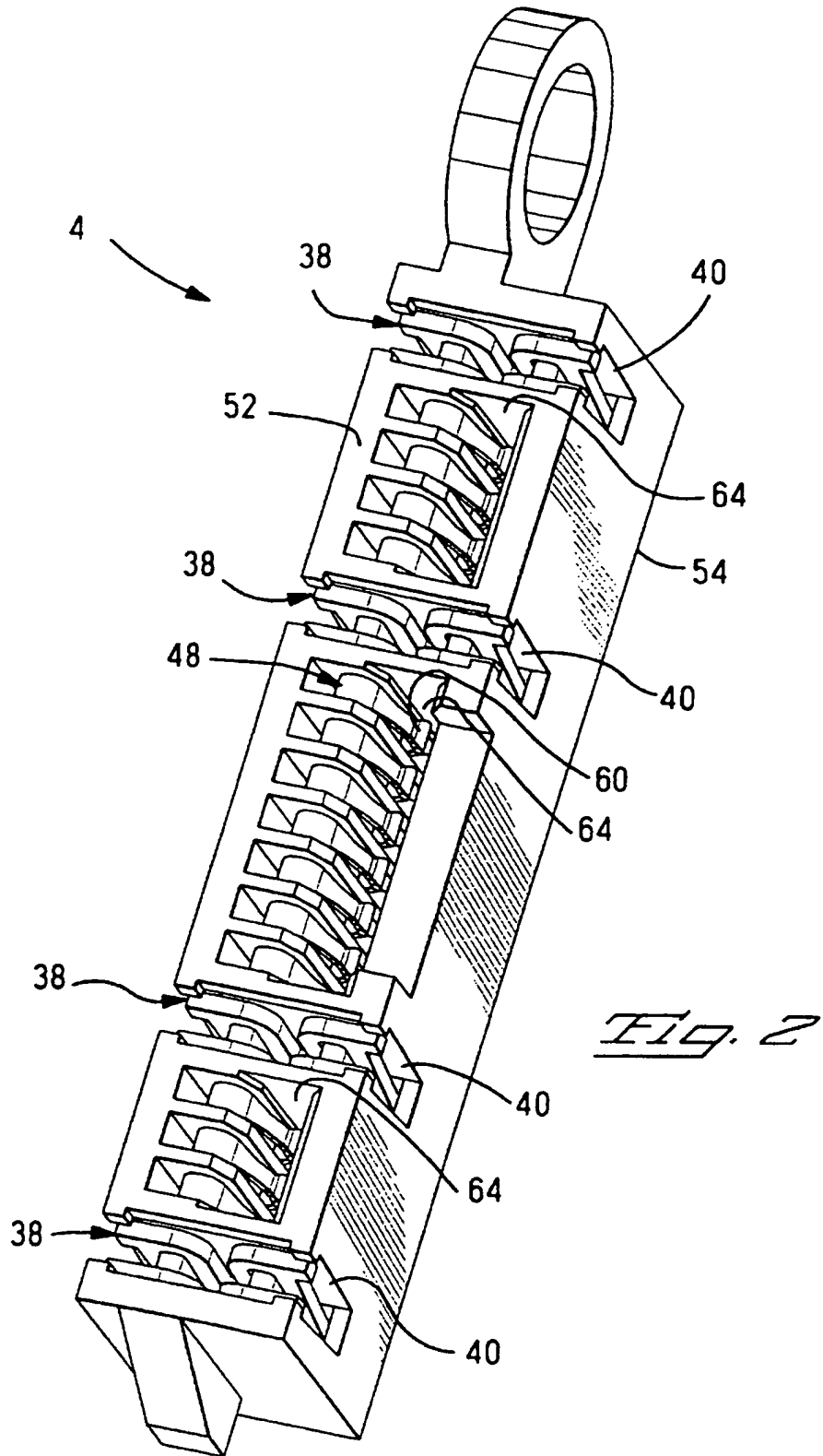
Portable device connection assembly

(57) A connection assembly has an in-portable connector (4) and a cradle connector (6). The cradle connector has rigid latching members (20) that engage within cavities of the in-portable connector provided with flexible latch members (38) having spring latch arms (66). Both the rigid and flexible latch members are edge-stamped from sheet metal for a relatively compact yet robust latching. Provision of the exposed latch members (20) as rigid members and protection of the more delicate flexible latching members (38) fully within connector cavities (40), reduces the risk of damage to the latching system.

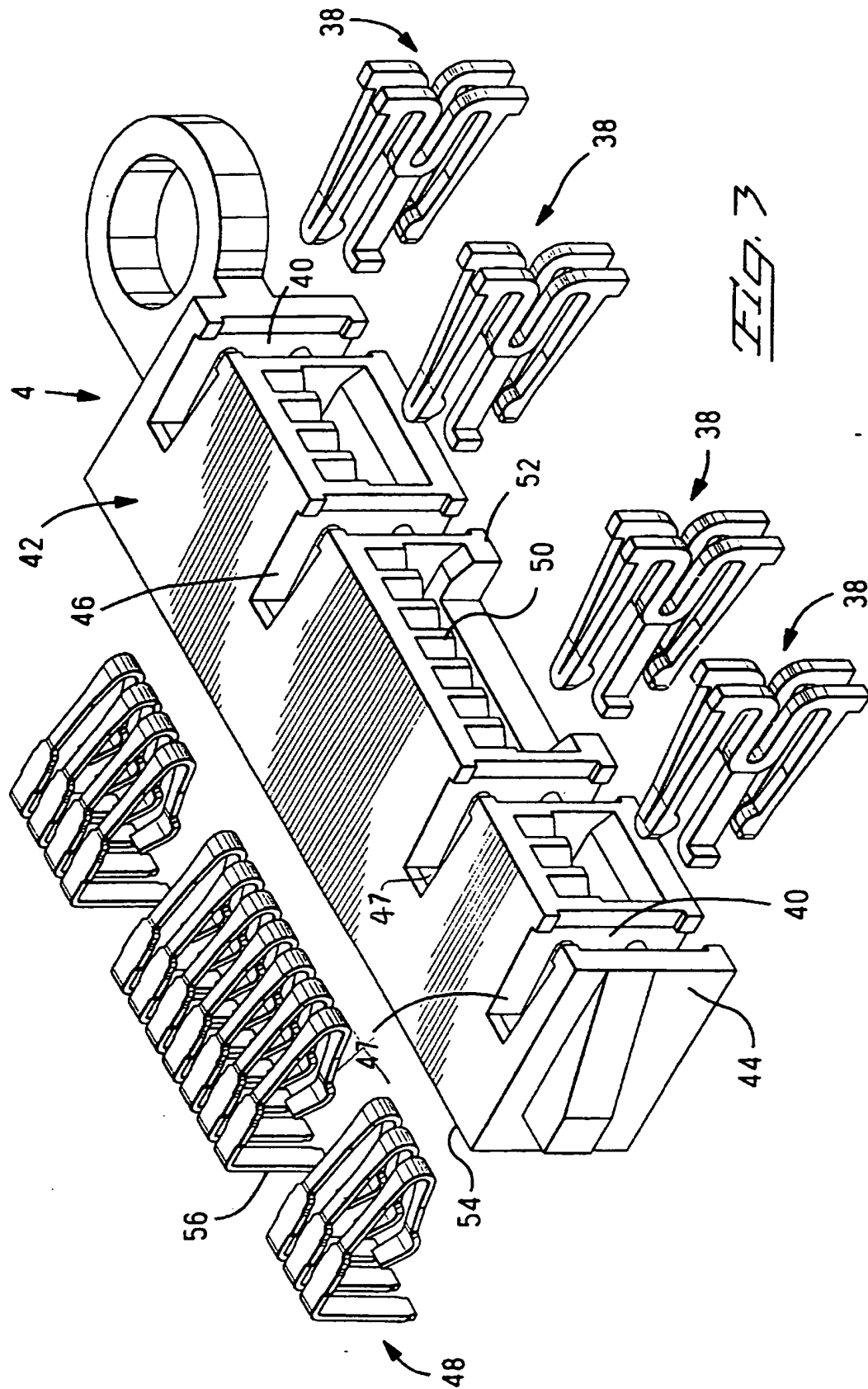


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*Fig. 2*



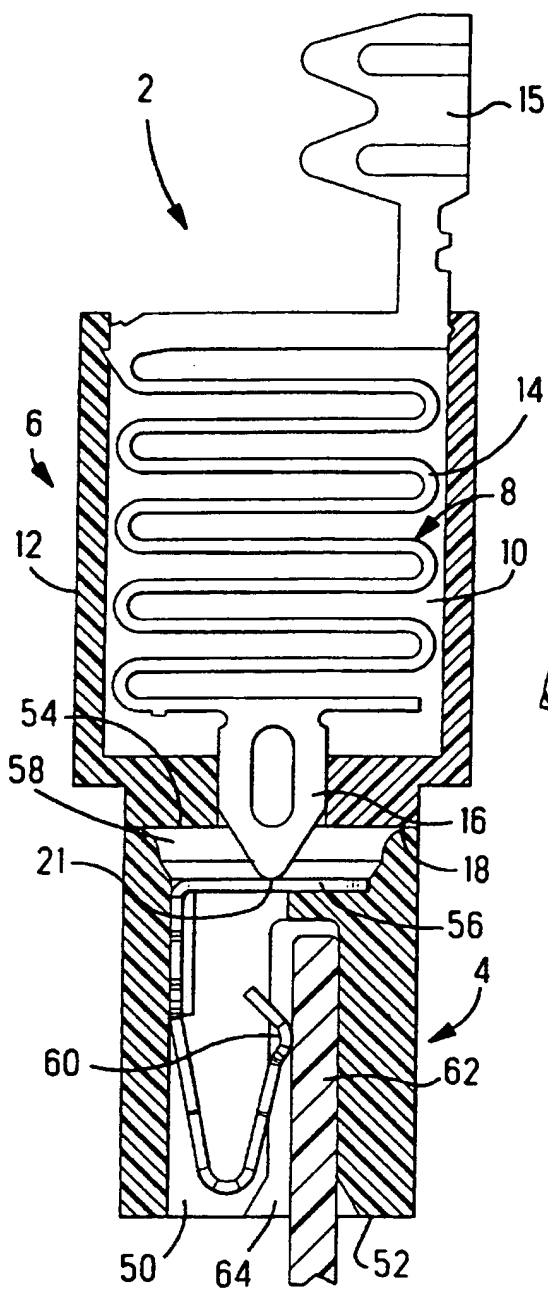


Fig. 4

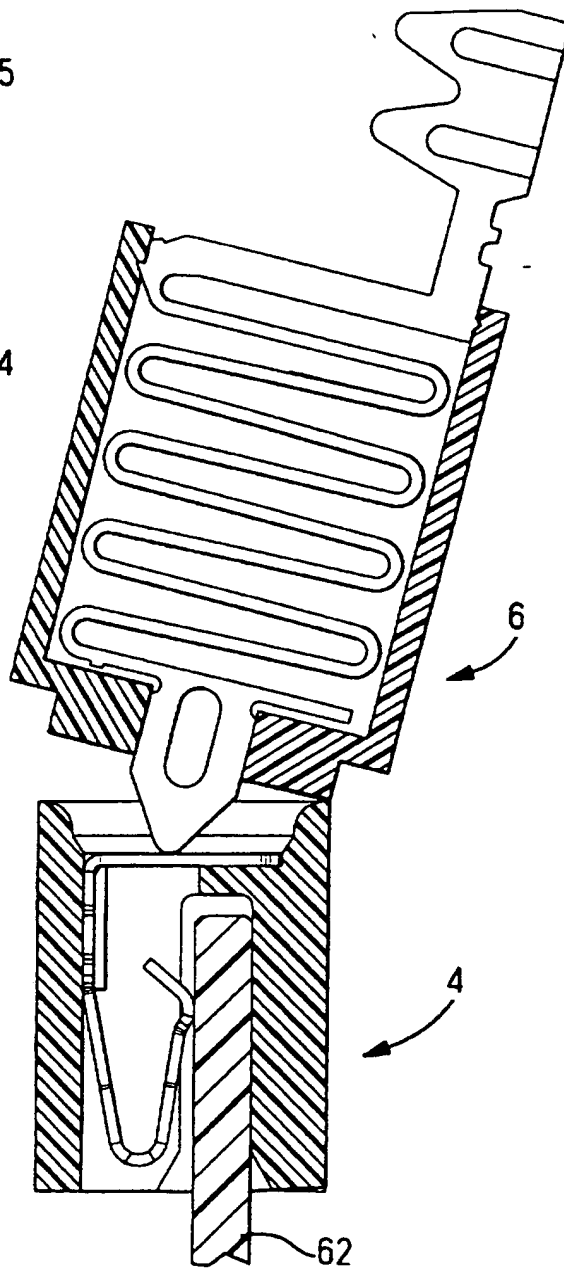
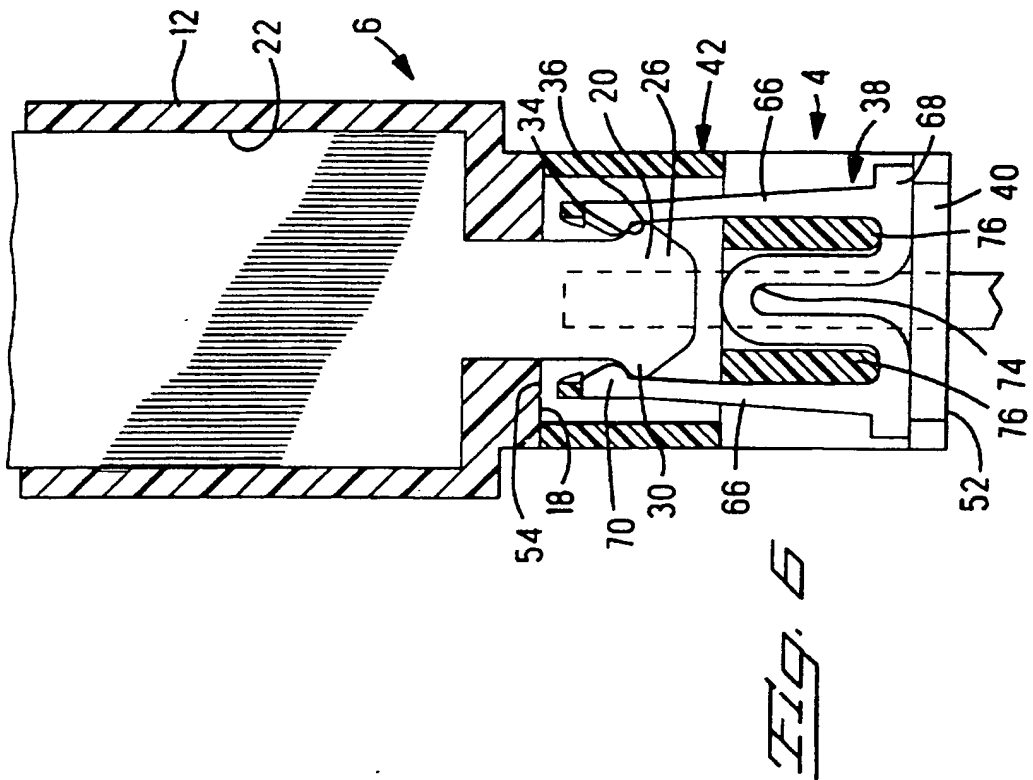
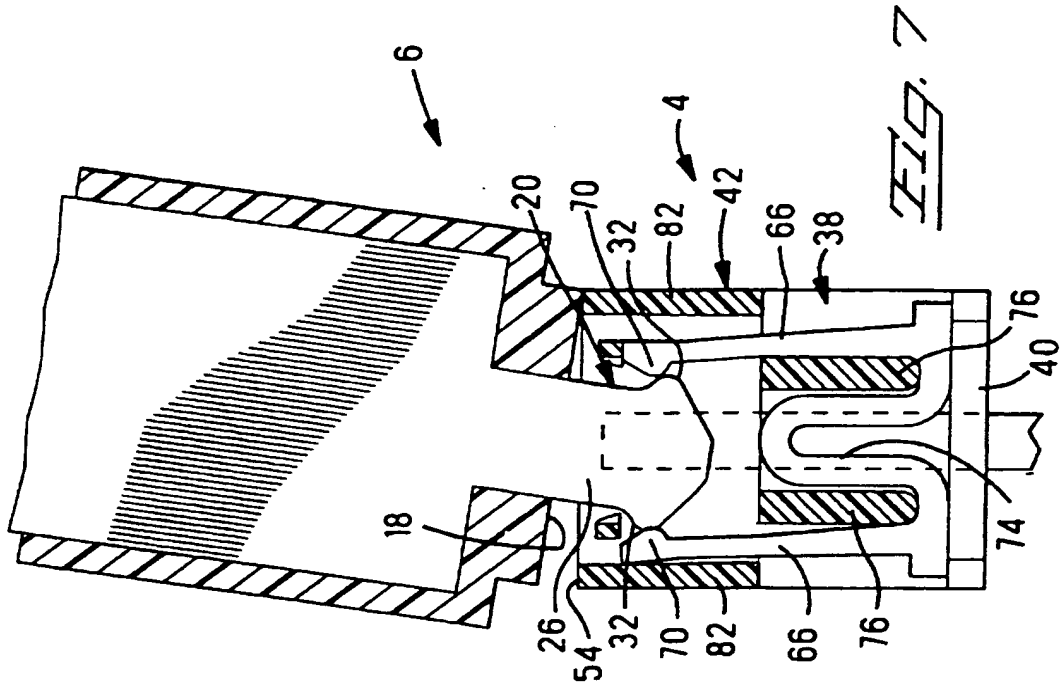
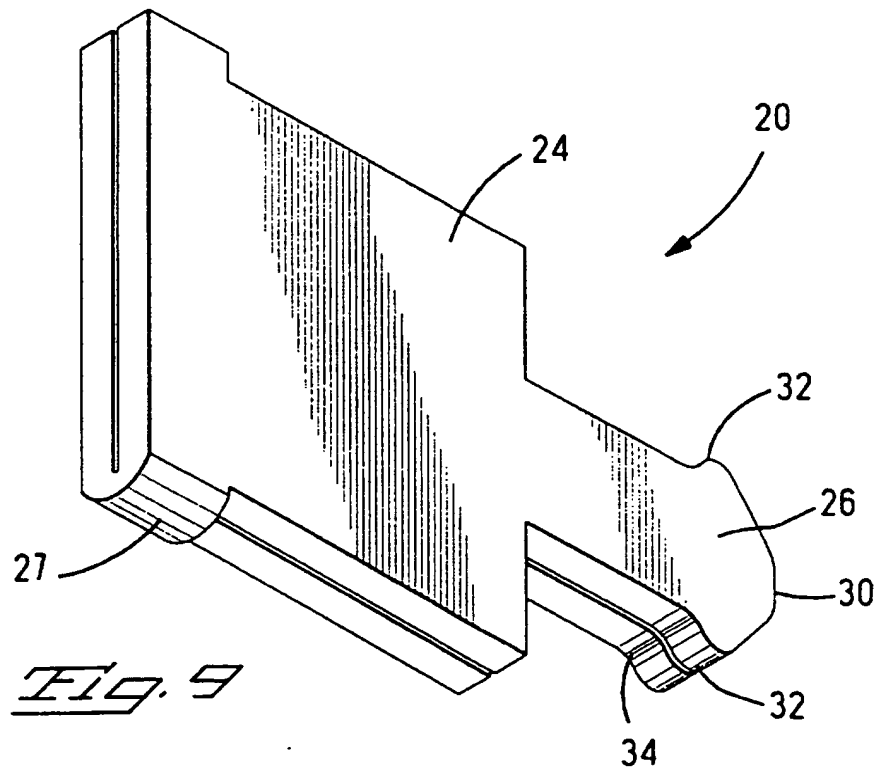
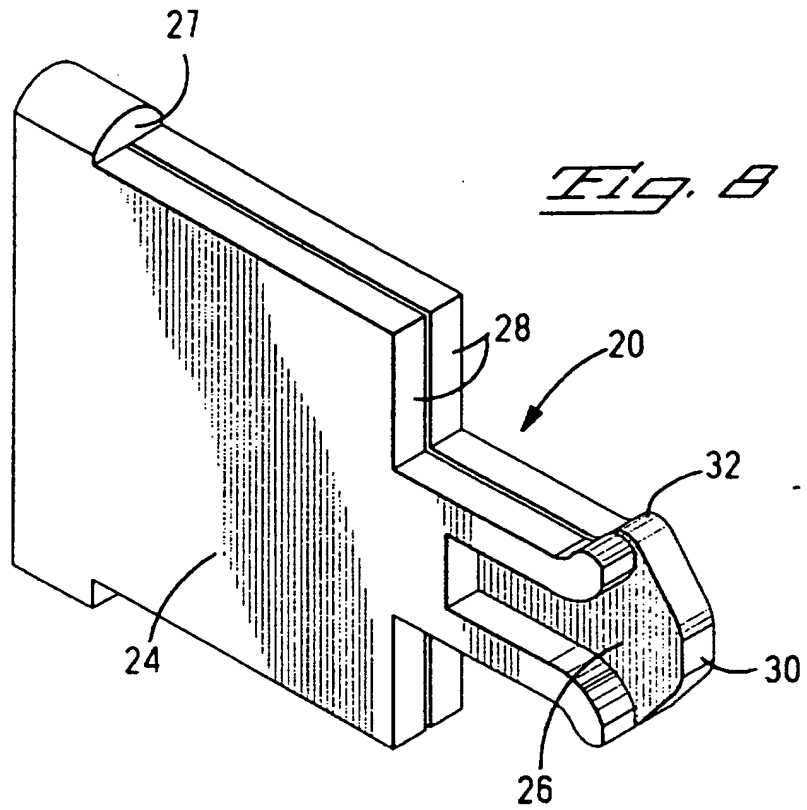


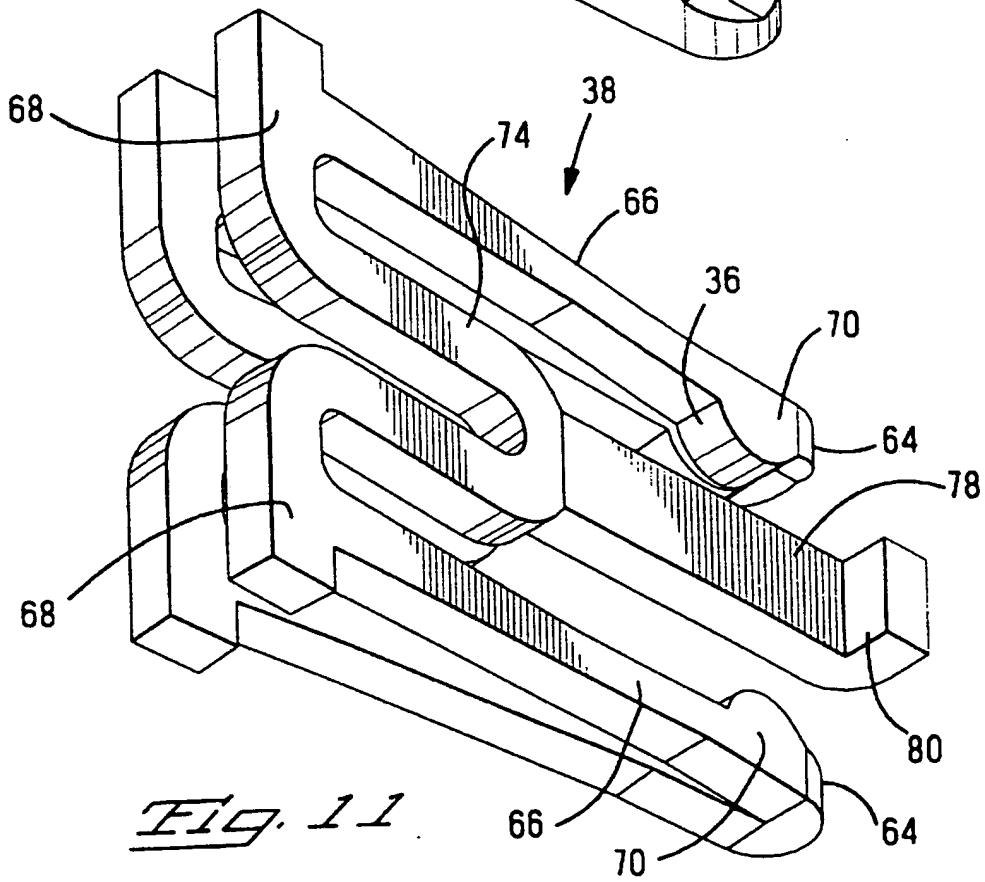
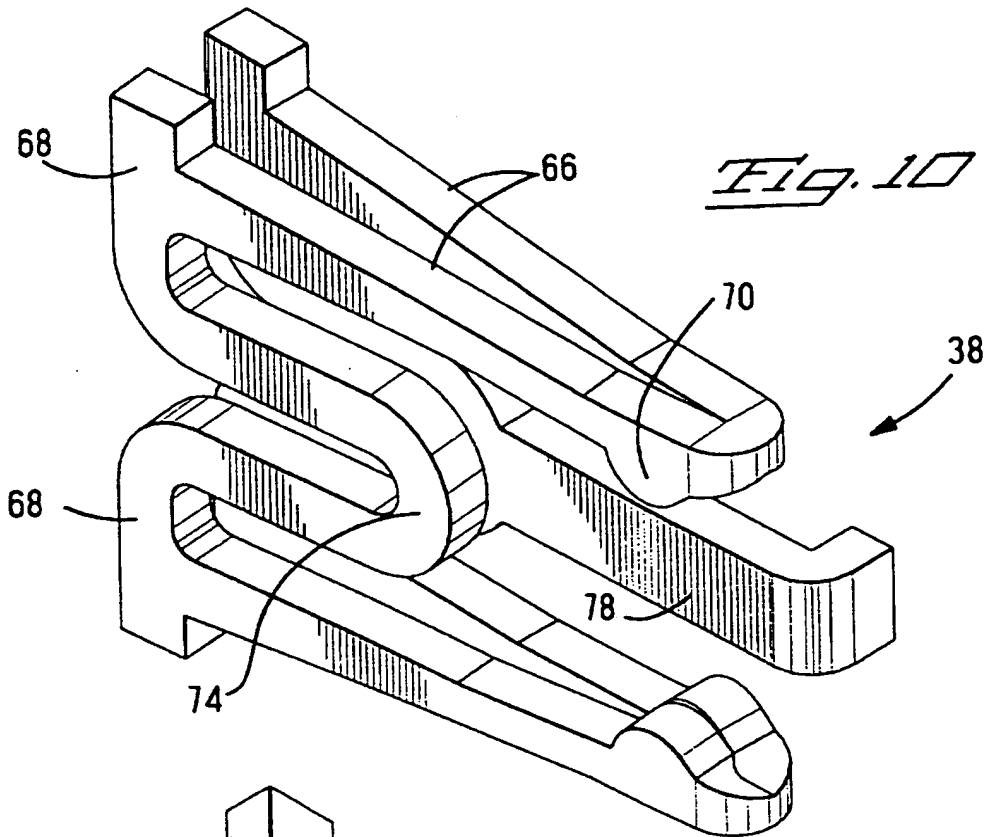
Fig. 5

s/h



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PORTABLE DEVICE CONNECTION ASSEMBLY

This invention relates to an electrical connection assembly for interconnecting a portable device such as a mobile telephone to a base device such as a cradle, or to other portable devices or plugs.

A mobile phone connection assembly is described in international application W 096/28865. Disclosed therein is a connection system comprising an in-phone connector mountable in a telephone and having plurality of juxtaposed strip contacts for electrical connection to contacts of a cradle connector or portable plugs of devices such as modems, power-plugs, etc. The cradle connector or other complementary plug connectors for connection to the in-phone connector comprise edge-stamped contacts having supple meandering spring sections to enable large travel for compensating tolerances in connector positioning. The cradle connector and other complementary connectors further comprise latches that are received in corresponding latching cavities of the in-phone connector. The latches are resilient plastic mouldings that resiliently bias and engage latching shoulders in cavities of the in-phone connector. The latches project beyond tips of the cradle connector contacts thereby providing some protection to the exposed portion of the contacts. There is nevertheless a risk of damage to the latches by abutment with external objects. The latches are also relatively large in relation to the connector in order to provide the requisite resiliency and strength. Portable device connectors are subject to relatively high mechanical solicitation, for example when the portable device is placed on its cradle with angular misalignment.

It is an object of this invention to provide a portable device connection assembly that is versatile, yet compact and robust. It would also be advantageous to provide a connector assembly that is cost effective to manufacture.

Objects of this invention have been achieved by providing the connection assembly according to claim 1. Disclosed herein is a portable device connection assembly comprising an in-portable connector for assembly to a portable device, the in-portable connector having a insulative housing and a plurality of juxtaposed contacts positioned therein, the contacts having a top contact surface for receiving complementary contacts of complementary connectors thereagainst, the juxtaposed contacts of the in-portable connector including power, data and signal contacts, the connection assembly further comprising latching members enabling secure plugging of complementary connectors to the in-portable connector, wherein the latching members of the in-portable connector are provided within cavities extending within the connector housing from the top contact surface for receiving complementary latch members of the complementary connectors therein, the complementary latch members comprising substantially rigid latch shoulders for engaging resilient latching arms of the latching members arranged within the cavities of the in-portable connector.

Advantageously therefore, a well protected and robust, yet compact connection assembly for portable devices may be provided.

A particularly compact latching member may be provided by stamping and forming the resilient in-portable connector latches from sheet metal. A particularly precisely dimension latch may be provided

by edge-stamping the latch from sheet Metal such that the resilient latch arm biases in a direction substantially within a major plane of the sheet metal. The strength of the latch may be further enhanced by doubling over the edge-stamped latch profile thereby increasing the thickness of the latch without resorting to the use of thicker and therefore more costly sheet metal. The substantially rigid complementary latch member may also be stamped and formed from sheet metal, but could also be moulded from plastic, for example integrally with the complementary connector housing. The substantially rigid complementary latch member may also be edge-stamped and doubled over in order to increase the thickness. The latches may be easily assembled into the in-portable connector cavities by stitching the contacts into the cavities in a manner similar to insertion of terminals into terminal receiving cavities of a connector. A plurality of latching members may be provided in different positions in order to accept latching of different complementary connectors at different positions, for example charger plugs, signal plugs, or a cradle connector.

An embodiment of this invention will now be described by a way of example, with reference to the accompanying drawings, in which;

figure 1 is an isometric view of an in-portable connector;

figure 2 is an isometric view of the in-portable connector of figure 1 from a PCB receiving side;

figure 3 is an isometric exploded view of the connector of figures 1 and 2;

figure 4 is a cross-sectional view through a connection assembly according to this invention showing a contact of a complementary connector resiliently biased against a strip contact of the in-portable connector;

5 figure 5 is a view similar to figure 4 but showing the in-portable connector being coupled to the complementary connector at an angle during coupling;

figures 6 and 7 are cross-sectional views relating to the coupling positions of figures 4 and 5 respectively,  
10 but showing latching members of the connections assembly;

figures 8 and 9 are isometric views of a substantially rigid latching member of a complementary connector;

figures 10 and 11 are isometric views of the resilient latching member of the in-portable connector.

15 Referring to the drawings, particularly figures 4 and 6, a portable device connection assembly 2 comprises an in-portable connector 4 and a complementary connector 6 matable with the in-portable connector. Different complementary connectors 6 may be provided. For example,  
20 the complementary connector may be a cradle connector assembled in a support for receiving a portable device such as a telephone, or the complementary connector may be a charger plug or a signal plug for connection to corresponding contacts of the in-portable connector 4. The  
25 charger and signal plugs may for example be connected through cables to other devices which may also be portable devices such as modems etc.

Each of the different complementary connectors comprises terminals 8 mounted in cavities 10 of a housing  
30 12, the terminals comprising a supple meandering spring section 14 extending between a connections

section 15 and a contact 16. Different complementary connectors may have different members for terminals, for example a charger plug may have only 2 terminals, a signal plug 7 terminals and a cradle connector the full set of the terminals corresponding to all the in-portable terminals. The contact 16 is biasable beyond a mating face 18 of the complementary connector against contact strips of the in-portable connector 4.

The complementary connector 6 is further provided with one or more (preferably two) substantially rigid latch members 20 projecting from the mating face 18 beyond tips 21 of the contacts 16 when the contacts are fully outwardly biased. The latch members 20 thus protect the contacts 16 from damage by abutment of the connector with external objects. The substantially rigid latch members 20 are received within latch receiving cavities 22 in the complementary connector housing 12, the latch member 20 being stamped and formed from sheet metal into a substantially planar shape as best seen in figures 8 and 9. The rigid latch member 20 comprises a base portion 24 and a latching portion 26 that projects beyond the mating face 18 of the housing. The rigid latch member is substantially edge-stamped from a plane of sheet metal which is folded over at a bend 27 into double thickness 28. This enables a robust latch member to be produced whilst stamping and forming from thin sheet metal for cost effective manufacturing. Also, the substantially planar edge-stamped shape is particularly simple and therefore cost effective to stamp and form. The rigid latch member may, however, also cost effectively be moulded from plastic integrally with the connector housing, or be formed separately of plastic or another material and mounted to the housing similarly to the stamped and formed embodiment. The latching portion 26

extends from the base portion 24 to a free end 30, which is the outermost end. Proximate the free end 30 is an enlarged head 32 forming latching shoulders 34 therebehind for engaging latch shoulders 36 (see figure 6) of a resilient latching member 38 positioned within a latch receiving cavity 40 in a housing 42 of the in-portable connector.

As best seen in figure 3, the in-portable connector 4 is provided with a plurality of resilient latch members 38 positioned in the latch receiving cavities 40 proximate ends 44 of the housing, or at intermediate positions 46, 47 whereby terminals 48 are positioned either side of the intermediate positions 46, 47.

The terminals 48 are all substantially identical and arranged in a juxtaposed manner within terminal receiving cavities 50 of the housing that extend from a printed circuit board receiving end 52 to a complementary connector receiving end 54 of the housing 42. Each terminal 48 has a substantially planar contact pad 56 arranged in a recess 58 (see figure 4) below the mating end 54, for receiving the resilient complementary contact 16 thereagainst. The other end of the terminal 48 is provide with a resilient cantilever beam contact arm 60 for biasing against conductive circuit traces of a printed circuit board 62 received in a slot 64 extending from the PCB receiving end 54 of the housing. The printed circuit board 62 may for example comprise electronic components of a mobile portable or other portable device.

Referring to figures 6, 7, 10 and 11, the resilient latch member 38 is stamped and formed from sheet metal whereby the latch is substantially edge-stamped out of a substantially planar piece of sheet metal and folded over at a fold 64 such that the material thickness of

the latch is substantially double the thickness of the sheet metal from which it was stamped. The resilient latch member 38 comprises a pair of opposed spring arms 66 extending from a base portion 68 proximate the PCB receiving end 52 towards a latching portion 70 proximate the mating end 54 of the connector 4. The spring arm 66 is in the shape of cantilever beam whereby the free end is proximate the latching portion 70. The latching portion 70 is provided with the latching shoulder 36 that engages the complementary latching shoulder 34 of the substantially rigid latch member 20. During coupling of the connectors 4, 6, the spring arms 60 are thus resiliently biased apart during insertion of the enlarged portion 32 of the rigid latch member past the latch portions 70 of the flexible latch member.

The stamped and formed latch member 38 is particularly well protected as it is within the cavity 40 of the connector, and is also particularly compact due to the stamping and forming from sheet metal, in addition to being robust.

The base portion 68 may be provided with an upwardly bent U-shape 74 positioned centrally between the opposed spring arms 66 that on the one hand may serve to enhance the flexibility of the spring arms 66, and additionally provide a guiding and locating means within corresponding locating wall portions 76 of the housing. As best seen in figures 10 and 11, the resilient latch may further be provided with a resilient locking lance 78 having a locking shoulder 80 that engages a corresponding shoulder (not shown) in the cavity 40 of the housing 42.

As best seen in figure 7, the in-portable connector may be plugged to the complementary connector at an angle, whereby the rounded corners of the enlarged head

portion 32 of the rigid latch portion smoothly prises  
apart the latch portions 70 of the flexible latch member  
38. The provision of the latch spring arms 66 and latch  
portions 70 below the mating end 54 ensure that the  
5 rigid latch portion 26 is guided between the latch  
portions 70 without risk of damaging the flexible latch  
38. Overstress of the latch spring arms 66 is prevented  
by abutment thereof against side walls 82 of the housing  
42. As best seen in figures 3 and 6, the latch members  
10 38 can be easily assembled to the housing 42 by  
insertion into the cavity 40 from the PCB receiving end  
52. The biasing of the spring arm 66 during latching  
occurs substantially within the plane of the sheet  
metal, such that a relatively large spring force can be  
15 optimally provided despite manufacturing of the latch  
member from relatively thin sheet metal. Advantageously,  
the exposed latch portion 26 of the complementary  
connector 6 is relatively rigid and robust, whereas the  
resilient member is protected within the in-portable  
20 connector.



CLAIMS

1. A portable device connection assembly comprising an in-portable connector for assembly to a portable device,  
5 the in-portable connector having an insulative housing and a plurality of juxtaposed contacts positioned therein, the contacts having contact surfaces for receiving complementary contacts of a complementary connector thereagainst, and latching members enabling secure plugging  
10 of the complementary connector to the in-portable connector, wherein the or each latching member of the in-portable connector is disposed within a cavity extending within the connector housing from a mating end for receiving a complementary latch member of the complementary  
15 connector, and the or each complementary latch member comprises a substantially rigid latch portion with latch shoulders for engaging resilient latching arms of the cooperating latching member of the in-portable connector.
2. The assembly of claim 1 wherein the or each in-  
20 portable latching member is stamped and formed from sheet metal.
3. The assembly of claim 2 wherein the or each in-  
portable latching member is edge-stamped from sheet metal such that the resilient latching arms thereof bias in a  
25 direction substantially within a major plane of the sheet metal.
4. The assembly of claim 2 or 3 wherein the sheet metal of the or each in-portable latching member is doubled over thereby increasing the thickness.
- 30 5. The assembly of any one of the preceding claims wherein the or each rigid complementary latch member is stamped from sheet metal and doubled over in order to increase the thickness thereof.

6. The assembly of any one of the preceding claims wherein a plurality of in-portable latching members are provided in different positions in order to accept latching of different complementary connectors at different positions.
- 5 7. A portable device connection assembly constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.



Application No: GB 9812634.5  
Claims searched: 1 to 7

Examiner: Mr F J Fee  
Date of search: 8 January 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H2E [ECCC, E203]

Int Cl (Ed.6): H01R

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	US 5334038 [DAVIDGE] connector latching inserts have arms which engage shoulders in holes 34 in counterpart, figures 3, 4, 4a, column 8 line 22 to column 9 line 14	1
X	US 5211571 [ARAI] fingers 26 engage shoulders in hole 32, figures 3, 6, 8, 10, 11, 13	1
X	US 5160275 [NAKAMURA] latches 6, 14C engage shoulders in hole P2	1
X	US 5035642 [VITTONI] resilient arms 6 and rigid portions 11	1
X	US 4828510 [MUZSLAY] latches 68 and rigid counterpart 102, figure 9	1
X	US 3970353 [KAUFMAN]	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.